AUDIO ETC.

Edward Tatnall Canby

Armstrong II- "The Expense of greatness"

On the night of January 31, 1954, Major Edwin Howard Armstrong, who claimed to be the inventor of workable FM radio transmission, of the superheterodyne circuit found in millions of radios, of the super-regenerative circuit, and (moving backwards in time) the original regenerative vacuum tube circuit of 1912, from which derives the whole of modern broadcasting and communications, plus the whole of modern electronic amplification, dressed himself up as for an evening party, impeccably, and stepped out through the thirteenth floor window of his large New York apartment in River House. His body was found below, the next morning.

Only a year or so later, *Man of High Fidelity*, the Lawrence Lessing biography* discussed in this department last month, was completed—through that dreadful day of infamy in radio-electronics and briefly beyond, to cover the settlement of the estate, the closing down

Major Armstrong is shown working 1,200 feet above the Hudson River, N. Y., on his FM antenna.

his work and of his inventions themselves, has gone onwards as projected in the final pages of his written life. The of Armstrong's pioneer radio station at Alpine, N. J., into which he had poured almost two million dollars and, paradoxically, the first, ironic beginnings of an Armstrong upturn, too late.

Only two months after his death, the British BBC announced a high fidelity FM network that would cover all of their island territory. The U.S. Army Signal Corps dedicated Armstrong Hall at Fort Monmouth, N. J., as a museum of early radio apparatus. Armstrong's recent work in FM radar, which had seemed to be lagging dismally, now picked up energy and moved ahead at his old hangout, Columbia University. But the most important final event that got into the very end of the Lessing biography of 1956 was the settlement of the colossal FM infringement suit, tendered by Armstrong against R.C.A., with payment of almost a million dollars into the Armstrong estate.

Ironic indeed. By his suicide, he won a battle. When he died, Armstrong was on the point of financial disaster. He had been fighting that battle against enormous corporate forces, since 1949, full-time, time-and-a-half. It was the gargantuan straw that finally broke an indominable spirit. Preposterous thought! Imagine an individual—any individual—taking on a top-size corporation on terms of equality; imagine any corporation of such size having to cope on its own grand scale, millions of dollars at stake, with a single, *individual* adversary! That is the drama of the final Armstrong story and, to a slightly lesser degree, the earlier stories of the same sort, notably the endless struggle between the De Forest interests and Armstrong over the original regenerative circuit patent. That battle went on for no less than fourteen years. Armstrong lost it. Against fact.

As we all know, a very great deal has happened since 1956, the year of the Lessing biography of Armstrong. Heartening things, at last. The trend towards "rehabilitation" both of Armstrong's own importance and towards recognition of

rest of the story, up to date, has now been added by Lessing. With luck, we'll all soon have a crack at the final new chapter when and if the much-to-be-desired paperback edition appears. (I am personally plugging for it simply because of the importance of the book; I have no connection with the project other than the words in this column.)

What happened after 1956? Well, obviously, the great 1933 FM invention (or discovery) at last found its burgeoning place in radio. Not only public broadcasting, but in a hundred-thousand other areas, most notably in space communications, a field which, Mr. Lessing notes, would really have thrilled the Major's heart.

But if he had lived on, where would he be now? Would the same old corporate battles still drag on, would new inventions, new applications (such as

Edwin Howard Armstrong, inventor of FM radio.

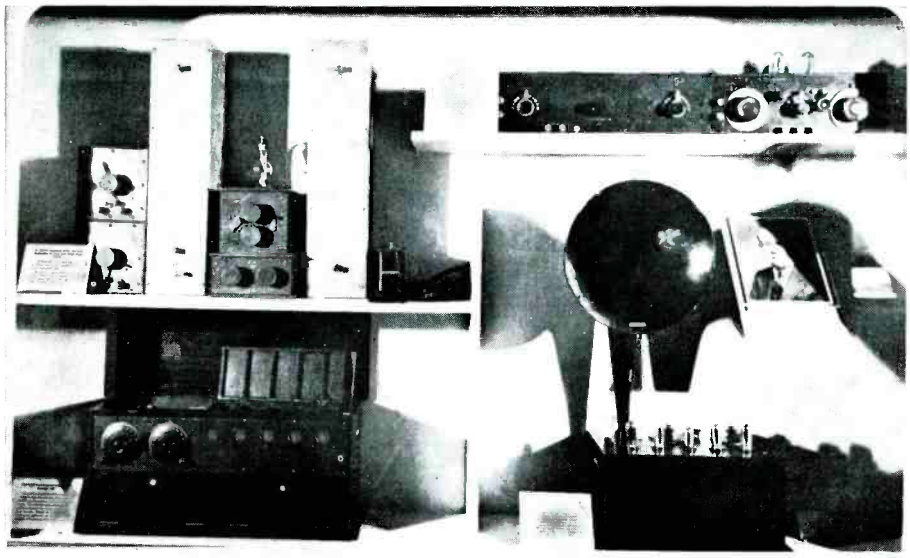
space) of his older ideas, merely lead to newly epic legal battles, further denying him his own work, discrediting him further—where, dead and no longer a living menace, he is now at last receiving objective, non-biased recognition? It is the tragedy of the great inventor in an age of corporate might.

He was a bull-headed man, this Armstrong, and a soberly honest one; that was the trouble. The idea of a smooth compromise seemed beyond him. He wanted the truth and nothing but it. He was obstinate. His life was one long fight—but most of the fights were started by him. And they were carried on with every bit of personal force he could

* *Man of High Fidelity: Edwin Howard Armstrong. 1956, J. B. Lippincott, Philadelphia, Pa.*

muster, plus all of the large fortune he managed to make in between the corporate wars. He was perhaps the only great inventor who had the financial power (a) to launch his own inventions *in spite* of corporate disinterest, as he did FM, and (b) to fight for his rights at the top corporate level. Not even Edison (who was another fighter) ever managed that. Edison fought for his personal stake in company after company, but it was never quite Edison himself against industry in the sense, and on the scale, of Armstrong's battles.

And so the story of Armstrong is also the story of the modern super-corporation itself, against which he fought, and this is Lessing's most fascinating account. For the power of a giant corporation goes far beyond any individual within its shape; it often turns soullessly upon any person or thing which impedes the basic corporate aims—profit and expansion, control of more and more power.



Shown here are Armstrong's first regenerative or "feedback" radio receiver, and first, second and third superheterodyne receivers.

Even within the corporation, as we should all know by now, its members are at its impersonal mercy, from the botton straight up to the very top.

It was no more possible for the corporate executives to "let Major Armstrong off," so to speak, without a fight down to the last legal phrase, than for a lioness to spare its prey in mid-kill. He was the victim of a monstrous machinery, not of vindictive human beings as individuals.

Even language itself is at the mercy of corporate power dynamically-aroused in its own interest. The very process of legal reasoning, the force through which the battles are joined, can be blandly turned straight against scientific fact. This is Lessing's greatest message for us and all the more so because it is not so much a "good-versus-evil" message as a statement of the dramatic facts of life as they are today. Like a novel, the characters, Armstrong and the corporation, are brought into epic, tragic, legal conflict; that is the real drama.

The corporation, if I read Lessing right, may perhaps be hated and feared, it may do untold damage, it may hold up progress as often as it advances it, but it is not inherently evil; it simply *is*. It exists, it has weight. It has enormous power, and it wants more by a sort of corporate instinct.

And so *Man of High Fidelity* is not really one-sided, though the author passionately feels for his bull-headed, obstinat Major. The Major's long battle, so often downhill and backwards, is the more poignant because of this fairness (again, as I read it) with which the other side is treated. Though he is *very* far from agreeing with the anti-Armstrong arguments, Lessing presents them, exhaustively. I doubt if we will ever have a fairer exposition of the facts and the claims.

Perhaps the most interesting argument that emerges from this book is one we all hear about these days—the inability of the corporate kind of team laboratory research to come up with the sort of basic intuition that has governed the great inventions of history until now. It's a fascinating question—for certain kinds of invention do, indeed, come out of team research, and more so in every year of our increasingly complex progress. The computer itself, I'd guess, is a case in point. Transistors? Integrated circuits? Nuclear fuelings? Assorted missiles? Team work, all.

These and a thousand other inventions are irrevocably corporate in nature; no individual could conceive or finance them whole. But are they really *inventions?* Basic discoveries?

Again and again, the materials for a *basic* invention have been at hand, practically under our noses, and no one has seen the light, until the right mind suddenly puts the parts together. Edison didn't invent the electric light, nor even the phonograph, nor did Morse invent the telegraph. Each of them did put two and two together, out of others' groupings, to make a definitive, *workable* product, to shape a new area, a principle which, like Edison's Pearl Street power plant in New York and its integrally designed high-voltage bulbs, can become the matrix for enormous future undertakings.

Simultaneous Discoveries

It is one of the curious miracles of science that, time and time again when conditions are exactly ripe, *two* inventors—often more—simultaneously come upon the same idea, within days, even hours of each other. It has happened astonishingly often, so often that no scientific "explanation" can dull the miracle of it.

So it was with Bell and Gray, the telephone men. So, too, with Faraday's discovery of electrical induction in England and the same discovery, here in America (though less well known) by our own Joseph Henry. In 1745 two men simultaneously discovered the principle of the storage capacitor for electricity; one was an amateur, a Bishop von Kleist in Germany, the other a professor by the name of Van Musschenbroek in Leyden, Holland.

The first to report in each case got the credit—Bell, Faraday, the Leyden experimenter. (Hence the Leyden jar.) Whether it's a patent application or the original written-down sketch of an idea, the time factor counts crucially—and often it has come down to a matter of minutes. After centuries.

How often does a *research team* find its discovery simultaneously discovered by another team? Oddly—quite often. For we are now talking of that moment of ripeness, not so much of the individual inventor. And yet—the inventor's mind is still essential, even now. Or it was, as long as Armstrong lived. No team ever matched his extraordinary *basic* circuit inventions.

Is it not the *basic* invention that belongs to the individual genius, whereas the team is splendid for the Before and the After—for the preparation of the cosmic moment, the ripeness, and for the following-up that comes later, the development and expansion?

Are there not inventors even within our teams—and doesn't the basic discovery always come from the one, brilliant mind that seizes the ripeness and *individually* hits upon the solution to the problem? That's my idea, anyhow. But you'll find plenty to illuminate it in the Armstrong biography.

Never forget that De Forest invented the vacuum-tube triode in 1906 but there was no real use for it, in spite of the whole swarm of radio-enthusiasts at work, until 1912 when a young engineer, still short of his student degree, worked out his idea of a receiving circuit to put it to use—and at the same time proceded to explain what really went on

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inside the tube. That was Armstrong, the genius-individual. Still an inventor on his own. The last?

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The date was November 5th, 1935, a date to remember. The meeting on 39th Street in New York was that of the Institute of Radio Engineers (I.R.E.) for a talk on "A Method Reducing Disturbances in Radio Signaling by a System of Frequency Modulation," presented by the well-known Major Armstrong. Some readers of this department of our magazine were undoubtedly on hand for that historic occasion.

On that day, the Major—a first-rate dramatic ham, always—put on a surprise FM broadcast demonstration for the I.R.E. members, right in front of their ears and eyes. *In 1935!* It took almost 25 years for FM broadcasting to live up to that occasion. Let me quote Lessing and, thus, give you a bit of the flavor of my current favorite book.

"For a moment the receiver groped through the soughing regions of empty space, roaring in the loudspeaker like surf on a desolate beach, until the new station was tuned in with a dead, unearthly silence, as if the whole apparatus had been abruptly turned off. Suddenly out of the silence came Runyon's supernaturally clear voice:

'This is amateur station W2AG at Yonkers, New York, operating on frequency modulation at two and a half meters.'

"A hush fell over the large audience. Waves of two and a half meters (110 megacycles) were waves so short that up until then they had been regarded as too weak to carry a message across the street. Moreover, W2AG's announced transmitter power was barely enough to light one good-sized electric bulb. Yet these shortwaves and weak power were not only carrying a message over the seventeen miles from Yonkers, but carrying it by a method of modulation which the textbooks still held to be of no value. And doing it with a life-like clarity never heard even on the best clear-channel stations in the regular broadcast band. . . . A glass of water was poured before the microphone in Yonkers; it sounded like a glass of water (in New York) and not . . . like a waterfall . . ."

So it goes on. Old stuff today! But when did *you* first hear that sort of clarity? I heard it eons ago, in the summer of 1942. FM—perfected FM—was then already nine years old.

When the Major died, FM was *twenty one*. And he died in the midst of trying to prove that he had invented it, and that it was useful. Still. After so long.

That, as Arthur Lessing points out, is the expense of greatness. P.S. The major's great invention is now, at last, getting off the ground. It's a success, FM! At the age of thirty four. Æ

Letters from Readers

Tape-type Reverb Unit

Sir:

I was surprised to find . . . May "Letters" column mentioned Fisher as the only one now making any reverberation equipment for hi-fi performance. The Schober Reverbatape Unit, a tape-type artificial reverberator, has for several years been . . . available for both organs and music systems . . . applies reverberation to the entire audio spectrum. It is, of course, higher in price than devices such as Fisher's, which use the Hammond springs, but it does not have . . . audible limitations inherent in spring systems.

RICHARD H. DORF
The Schober Organ Corp.,
New York, N. Y.

The Reverbatape Unit is also available in kit form—ED.

Sweet Smell of Success

SIR:

The March 1967 issue had a question [Tape Guide column] about d.c. braking instead of mechanical braking.

I know for a fact that d.c. braking is not only far simpler, but far superior to mechanical forms of braking. You state . . . if these brakes are left on too long, the motor will begin to smell. I have left the d.c. braking on for hours with never the slightest trace of odor.

EDWIN SCHWARZ
Warwick, R. I.

Seeks Amplifier Design Book

SIR:

I am having difficulty finding a book that gives a good method for the design of amplifiers, both tube and transistors. Assistance would be greatly appreciated.

HYMAN GOLDSTEIN
New York, N. Y.

There are many design *books available from numerous text book publishers. Suggest you visit your local public library and examine a directory of text books to determine which ones may be desirable.* Radiotron Designer's Handbook *might be helpful to you, though design information is restricted to vacuum tube technology. Don't overlook one of the best sources for design information: component manufacturers' manuals. General Electric, Motorola, Radio Corp. of America, Texas Instruments, and others offer a wealth of design information at reasonable prices.*—ED.

Author Improves Article

SIR:

Here's how to improve my article on Decibels [June, 1967 AUDIO] by changing one value.

By changing the one value given for 1 dB from "1.26" to '1.25', the last value equates with '1¼' or with '5/4.' Either of them can be handled mentally with ease.

To apply this advantage, let's start with the basic dB Table, the origin of which is given clearly in the article. But let's start the table by realizing that *no change* means *0 dB change*. That is, you still have all you start with (= '1'):

0 dB =	1	
3 dB =	2	
6 dB =	4	(Any change of *3 dB*
9 dB =	8	will either *double or*
12 dB =	16	*halve* the associated cor-
15 dB =	32	responding value of the
18 dB =	64	power ratio)
21 dB =	125	
24 dB =	250,	
etc.		

Between any pair of adjacent equations in this basic table, there can lie *only two* other equations for the table to skip no integral (whole-number) dB value. For instance, between *9 dB* and *12 dB*, there can lie *only two* other values: *10 dB* and *11 dB*. What values do their power ratios have?

To obtain the first (for 10 dB), simply increase the value found for 9 dB, *by ¼*, i.e., ¼ of 8 = 2; 8 + 2 = 10. So *10 db = 10*.

To obtain the second (for 11 dB), simply decrease the value for 12 dB *by ⅕*: ⅕ of 16 = 3⅕; 16 − 3⅕ = 12⅘ = (practically) 13. So, *11 dB = 13*.

In that simple way, the values for any two power ratios may be filled-in on the basic dB table.

GEORGE O'DONNELL
Sumter, So. Carolina